

## CLAIMS

We claim:

1. A method in a computer system for an executing application to forward requests for services that are received from remote clients to remote shared service providers, each remote shared service provider having an associated proxy component for communicating with the remote shared service provider, comprising:

instantiating a local messaging component able to communicate with each of the associated proxies; and

for each of multiple remote clients,

receiving a request from the remote client that a specified service be provided;

determining a first of the remote shared service providers that is able to provide the specified service;

notifying the local messaging component to request the specified service from the first remote shared service provider;

under control of the local messaging component, requesting the specified service from the first remote shared service provider on behalf of the remote client by,

retrieving configuration information for the first remote shared service provider that identifies a first proxy component associated with the first remote shared service provider;

when the first proxy component is not already instantiated, instantiating the first proxy component; and

sending a message to the first proxy component requesting that the first remote shared service provider provide the specified service;

receiving a response from the first remote shared service provider via the first proxy component; and

notifying the remote client of the received response,

so that a remote client can communicate with any of the remote shared service providers via an application with a local messaging component that interacts with proxy components associated with the remote shared service providers.

2. The method of claim 1 including, under control of each of the first proxy components:

receiving the sent message from the local messaging component;  
requesting the first remote shared service provider to provide the specified service;

receiving a response from the first remote shared service provider; and  
sending the received response to the local messaging component.

3. The method of claim 2 including, under control of each of the first remote shared service providers:

receiving the request from the first proxy component to provide the specified service;

performing processing associated with the specified service, the processing generating a response; and

sending the generated response to the first proxy component.

4. The method of claim 1 wherein each of the first remote shared service providers have multiple associated proxy components each for communicating with the first remote shared service provider to request distinct services provided by the first remote shared service provider, wherein the notifying of the local messaging component identifies a name of the specified service, and wherein the identifying of the first proxy component from the retrieved configuration information is based at least in part on the identified name of the specified service.

5. The method of claim 1 wherein the local messaging component and each of the first proxy components are software modules, and wherein the instantiating of the components includes executing the software modules.

6. The method of claim 1 wherein the local messaging component and each of the first proxy components are instances of object classes, and wherein the instantiating of the components includes creating the instances.

7. The method of claim 6 wherein the notifying of the local messaging component includes invoking an interface method of the local messaging component instance.

8. The method of claim 6 wherein the sending of the message to the first proxy component includes invoking an interface method of the first proxy component instance.

9. The method of claim 1 wherein the configuration information is retrieved from storage via a directory service using a unique name of the first remote shared service provider.

10. The method of claim 9 including storing the configuration information using the directory service before the retrieving.

11. The method of claim 1 wherein the retrieved configuration information includes initialization information for each of the first proxy components, and wherein the instantiating of each of the first proxy components includes providing the initialization information to that first proxy component for use as part of its initialization.

12. The method of claim 1 wherein the notifying to request the specified service from the first remote shared service provider includes supplying a message to be sent

to the first remote shared service provider, and wherein the message sent to the first proxy component is the supplied message.

13. The method of claim 1 wherein the notifying to request the specified service from the first remote shared service provider includes supplying a message to be sent to the first remote shared service provider, and wherein the message sent to the first proxy component is a version of the supplied message that is transformed under the control of the local messaging component before the sending.

14. The method of claim 1 wherein the executing application includes an action handler component that receives the requests from the remote clients and notifies the local messaging component to request the specified services.

15. The method of claim 14 wherein the executing application has mechanisms for including multiple action handler components, multiple view handler components and multiple translator components, but includes only the local messaging component and the action handler component.

16. The method of claim 15 wherein the action handler component notifies the local messaging component to request specified services from remote shared service providers only on behalf of requests received from remote clients.

17. The method of claim 14 wherein the executing application includes at least one view handler component for transforming received responses into formats compatible with the remote clients before the notifying of the remote clients of the received responses.

18. The method of claim 17 wherein the view handler components perform the notifying of the remote clients of the received responses

19. The method of claim 14 wherein the executing application includes at least one translator component that transforms received requests from remote clients into a format compatible with the action handler component before supplying the received requests to the action handler component.

20. The method of claim 14 wherein the included action handler component notifies the local messaging component to request specified services from remote shared service providers only on behalf of requests received from remote clients, and wherein the executing application includes other action handler components that each notify the local messaging component to request specified services from remote shared service providers on their own behalf.

21. The method of claim 14 including verifying authorization of a remote client to have a specified service be provided by a remote shared service provider before the notifying of the local messaging component to request the specified service.

22. The method of claim 1 wherein the determining of the first of the remote shared service providers that is able to provide the specified service is based on an indication of the first remote shared service provider that is included in the request received from the remote client.

23. The method of claim 1 wherein the executing application includes multiple action handler components each for responding to requests from external clients with responses generated in a format used by the action handler component.

24. The method of claim 23 wherein the executing application includes multiple view handler components each for transforming generated responses in formats used by action handler components into formats compatible with external clients.

25. The method of claim 1 wherein the executing application and the remote shared service providers are part of a single intranet, and wherein the remote clients are located outside of the intranet.

26. A computer-readable medium whose contents cause a computing device to forward requests for services that are received from remote clients to remote shared service providers, each remote shared service provider having an associated proxy component for communicating with the remote shared service provider, by:

instantiating a local messaging component able to communicate with each of the associated proxies; and

for each of multiple remote clients,

receiving a request from the remote client that a specified service be provided;

notifying the local messaging component to request the specified service from a first remote shared service provider that is able to provide the specified service;

under control of the local messaging component, requesting the specified service from the first remote shared service provider on behalf of the remote client by,

retrieving configuration information for the first remote shared service provider that identifies a first proxy component associated with the first remote shared service provider;

instantiating the first proxy component; and

sending a message to the first proxy component requesting that the first proxy component notify the first remote shared service provider to provide the specified service;

receiving a response from the first remote shared service provider via the first proxy component; and

notifying the remote client of the received response.

27. A computing device for executing an application able to forward requests for services that are received from remote clients to remote shared service providers,

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each remote shared service provider having an associated proxy component for communicating with the remote shared service provider, comprising:

an application capable of, during execution, for each of multiple remote clients, receiving a request from the remote client that a specified service be provided, notifying a local messaging component that is able to communicate with each of the associated proxies to request the specified service from a first remote shared service provider that is able to provide the specified service, receiving a response from the first remote shared service provider via the first proxy component, and notifying the remote client of the received response; and

the local messaging component capable of, during execution, requesting from each of multiple first remote shared service providers a specified service on behalf of a remote client by retrieving configuration information for the first remote shared service provider that identifies a first proxy component associated with the first remote shared service provider, by instantiating the first proxy component, and by sending a message to the first proxy component requesting that the first remote shared service provider provide the specified service.

28. The computing device of claim 27 wherein the application includes an action handler component that performs the receiving of the requests from the remote clients and the notifying of the local messaging component to request specified services from the first remote shared service providers.

29. The computing device of claim 27 wherein the application includes a view handler component that performs the receiving of the responses from the first remote shared service providers and the notifying of the remote clients of the received responses.

30. A method in a computer system for an executing application to forward messages that are received from remote clients to remote services via a local messaging service, each of the remote services having an associated proxy for communicating with the remote service, the method comprising:

- for each of multiple of the remote clients,
  - receiving a message from the remote client to be sent to one of the remote services;
  - notifying the local messaging service to send the message to the remote service;
  - under control of the local messaging service,
    - identifying the proxy associated with the remote service by retrieving information associated with the remote service; and
    - sending the message to the identified proxy for communication to the remote service;
    - receiving a response to the sent message from the remote service via the identified proxy; and
    - sending the received response to the remote client.

31. The method of claim 30 including, under control of each of the identified proxies:

- receiving the sent message from the local messaging service; and
- communicating the received message to the remote service;
- receiving a response from the remote service; and
- sending the received response to the local messaging service.

32. The method of claim 30 wherein each of the remote services have multiple associated proxies each for communicating with the remote service in distinct manners, wherein the notifying of the local messaging services includes information identifying one of the distinct manners, and wherein the identifying of the associated proxy using the retrieved information is based at least in part on the included information.



33. The method of claim 30 wherein each of the identified proxies are object instances, and wherein the instantiating of the proxies includes creating the instances.

34. The method of claim 33 wherein the sending of a message to a proxy includes invoking an interface method of the proxy instance.

35. The method of claim 30 wherein the notifying of the local messaging service to send a message to a remote service includes the message, and wherein the message sent to the identified proxy for the remote service is a version of the included message that is transformed under the control of the local messaging service before the sending.

36. The method of claim 30 wherein the executing application includes an action handler that receives the messages from the remote clients and notifies the local messaging service to send the messages to the remote services.

37. The method of claim 36 wherein the executing application has mechanisms for including multiple action handlers, multiple view handlers and multiple translators, but includes only the local messaging service and the action handler.

38. The method of claim 37 wherein the action handler notifies the local messaging service to send messages to remote services only on behalf of remote clients.

39. The method of claim 36 wherein the executing application includes at least one view handler for transforming received responses into formats compatible with the remote clients before the sending of the received responses to the remote clients.

40. The method of claim 39 wherein the view handler components perform the sending of the received responses to the remote clients.

41. The method of claim 36 wherein the executing application includes at least one translator that transforms received messages from remote clients into a format compatible with the action handler before supplying the received messages to the action handler.

42. The method of claim 36 wherein the included action handler notifies the local messaging service to send messages to remote services only on behalf of remote clients, and wherein the executing application includes other action handlers that each notify the local messaging service to send messages to remote services on their own behalf.

43. The method of claim 36 including verifying authorization for a remote client before the notifying of the local messaging service to send a message from the remote client to a remote service.

44. The method of claim 30 wherein the executing application includes multiple action handlers that each respond to requests from external clients with responses generated by the action handler.

45. A computer-readable medium whose contents cause a computing device to send messages that are received from remote clients to remote services via a local messaging service, each of the remote services having an associated proxy for communicating with the remote service, by:

for each of multiple of the remote clients,

receiving a message from the remote client to be sent to one of the remote services;

notifying the local messaging service to send the message to the remote service;

under control of the local messaging service,

identifying the proxy associated with the remote service by retrieving information associated with the remote service; and

sending the message to the identified proxy for communication to the remote service;

receiving a response to the sent message from the remote service; and  
sending the received response to the remote client.

46. The computer-readable medium of claim 45 wherein the computer-readable medium is a data transmission medium transmitting a generated data signal containing the contents.

47. The computer-readable medium of claim 45 wherein the computer-readable medium is a memory of a computer system.

48. A computing device for forwarding messages that are received from remote clients to remote services via a local messaging service, each of the remote services having an associated proxy for communicating with the remote service, comprising:

an application capable of, for each of multiple of the remote clients, receiving a message from the remote client to be sent to one of the remote services, notifying the local messaging service to send the message to the remote service, receiving a response to the sent message from the remote service, and sending the received response to the remote client; and

the local messaging service capable of identifying the proxy associated with the remote service by retrieving information associated with the remote service and of sending the message to the identified proxy for communication to the remote service.

49. A computer system for forwarding messages that are received from remote clients to remote services via a local messaging service, each of the remote services having an associated proxy for communicating with the remote service, comprising:

means for, for each of multiple of the remote clients, receiving a message from the remote client to be sent to one of the remote services, notifying the local messaging service to send the message to the remote service, receiving a response to the sent message from the remote service, and sending the received response to the remote client; and

means for identifying the proxy associated with a remote service by retrieving information associated with the remote service and sending a received message to the identified proxy for communication to the remote service..

50. A method in a computer system for invoking functions of remote applications on behalf of remote clients, each of the remote applications having an associated proxy for communicating with the remote application, the method comprising:

for each of multiple of the remote clients,

receiving a request from the remote client to invoke a specified function of a remote application using at least one specified parameter value;

retrieving information associated with the remote application that identifies the proxy associated with the remote application;

when a copy of the identified proxy has not already been instantiated, instantiating a copy of the identified proxy;

notifying the identified proxy copy of the specified function and the specified parameter values;

under control of the identified proxy copy, invoking the specified function of the remote application using the specified parameter values;

receiving a response from the invoking of the specified function; and  
providing the response to the remote client.

51. The method of claim 50 wherein each of the remote applications have multiple associated proxies each for invoking distinct functions of the remote application, wherein the received request includes information identifying one of the distinct functions, and wherein the identifying of the associated proxy using the retrieved information is based at least in part on the included information.

52. The method of claim 50 wherein each of the identified proxies are object instances, and wherein the instantiating of the proxies includes creating the instances.

53. The method of claim 52 wherein the notifying of an identified proxy copy of a specified function and specified parameter values includes invoking an interface method of the proxy copy.

54. The method of claim 50 wherein the method is performed by an executing application such that an action handler included in the application receives the requests from the remote clients and forwards them to a messaging component of the application that notifies the identified proxy copies of the specified functions and the specified parameter values.

55. The method of claim 54 wherein the executing application has mechanisms for including multiple action handlers and view handlers, but includes only the local messaging component and the included action handler.

56. The method of claim 54 wherein the executing application includes at least one view handler for transforming received responses into formats compatible with the remote clients before the providing of the responses to the remote clients.

57. The method of claim 54 wherein the executing application includes at least one translator that transforms received requests from remote clients into a format compatible with the action handler before supplying the received requests to the action handler.

58. The method of claim 54 including verifying authorization for a remote client before the notifying of the identified proxy copy.

59. A computer-readable medium whose contents cause a computing device to invoke functions of remote applications on behalf of remote clients, each of the remote applications having an associated proxy for communicating with the remote application, by:  
for each of multiple of the remote clients,

receiving a request from the remote client to invoke a specified function of a remote application;

retrieving information associated with the remote application that identifies the proxy associated with the remote application;

when a copy of the identified proxy has not already been instantiated, instantiating a copy of the identified proxy;

notifying the identified proxy copy of the specified function;

under control of the identified proxy copy, invoking the specified function of the remote application;

receiving a response from the invoking of the specified function; and

providing the response to the remote client.

60. A computing device for invoking functions of remote applications on behalf of remote clients, each of the remote applications having an associated proxy for communicating with the remote application, comprising:

an application capable of, for each of multiple of the remote clients, receiving a request from the remote client to invoke a specified function of a remote application using any specified parameter values, retrieving information associated with the remote application that identifies the proxy associated with the remote application, instantiating a copy of the identified proxy, notifying the identified proxy copy of the specified function and the specified parameter values, receiving a response from the invoking of the specified function, and providing the response to the remote client; and

multiple identified proxy copies each capable of invoking a specified function of a remote application using any specified parameter values.

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